

FIRE ESCAPE LADDER

CROSS-REFERENCES TO RELATED APPLICATIONS

This is a non-provisional application based on and claiming the filing priority of co-pending provisional patent application Serial No. 60/432,770, filed December 12, 2002.

BACKGROUND OF THE INVENTION

This invention relates to a flexible, stowable fire escape ladder adapted for storage in a box or in the wall structure of a building.

Currently, affixed fire escape ladders are well-known in multi-story, multi-unit structures. These structures can be commercial or residential in nature.

Less common are single unit residential structures with fixed fire escape ladders. In such instances, it has been known to provide portable or removable ladders, either rigid or flexible in nature. Examples of such ladders are found in U.S. Patent No. 1,196,419 to Banyovits, 3,329,328 to Guldie, 3,809,181 to Steranic, et al., 6,012,549 to Adams, 5,971,105 to Jacobson, 6,029,771 to Keown, 6,129,178 to Shupp, Jr., 6,135,239 to Martin, et al., and 4,445,589 to Longenecker. Some of these removable, flexible fire escape ladders comprise storage compartments affixed to an interior wall such as adjacent to or beneath a window. Some references include compartments stored within a wall cavity and opening to the inside of the room adjacent the window and some comprise storage compartments opening on an outside wall adjacent a wall opening such as a window.

For permanently installed stowable ladders, it is required that there be sufficient space underneath a window to stow the bulk of the ladder. In instances where the lower sill of the window is close to the floor, such a stowable ladder cannot be used or must be stowed on the exterior wall of the structure, such as in the Longenecker '589 reference. In either case, the

compartment storing the ladder is secured to a portion of the building structure, such as with screws, while the ladder is attached to the storage compartment itself.

An object of the present invention is to provide a stowable ladder that is secured to the building structure itself to provide a stronger anchoring point for the ladder. Another object is to provide a stowable fire escape ladder that can be stowed inside a building structure even in those installations where the windowsill is otherwise too close to the floor to afford room for a fire escape ladder stowage compartment in the wall.

SUMMARY OF THE INVENTION

A ladder that is collapsible for storage in a cavity embedded within a wall of a building structure, and extendible from the cavity for release through an exterior opening of the building structure for egress during an emergency, comprises a first end for attachment to the building structure, a second end for release through the exterior opening, and a plurality of interconnected steps and links joining the first and second ends. The ladder further comprises an attachment structure for passing through an aperture in a structural member of the building structure and for connecting the first end of the ladder to the building structure.

In a further embodiment, the attachment structure is a rod inserted through a pair of corresponding apertures in adjacent structural wall members of the building structure.

In a further embodiment, the rod is threaded and held in alignment with the adjacent structural wall members by a plurality of threaded fasteners.

In a further embodiment, the ladder is collapsible for storage in a cavity embedded within a floor of a building structure and extendible from the cavity for release through an exterior opening of the building structure for egress during an emergency.

These and other features, objects, and benefits of the invention will be recognized by one having ordinary skill in the art and by those who practice the invention, from the specification, the claims, and the drawing figures.

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BRIEF DESCRIPTION OF

THE SEVERAL VIEWS OF THE DRAWING

FIG. 1 is a front view of a fire escape ladder enclosure according to the invention.

FIG. 2 is a front view of the fire escape ladder enclosure of FIG. 1 with the enclosure cover removed.

10 FIG. 3 is a perspective view of the fire escape ladder enclosure of FIGS. 1 and 2 in a framed building wall.

FIG. 4 is a front view of the fire escape ladder enclosure of FIGS. 1-3, with a fire escape ladder in a storage configuration.

15 FIG. 5 is a front view of a fire escape ladder enclosure of FIGS. 1-4 installed underneath a building window.

FIG. 6 is a cross sectional view of the fire escape ladder enclosure of FIGS. 1-5 in a use configuration.

FIG. 7 is a perspective view of a further embodiment of a fire escape ladder enclosure according to the invention.

20 FIG. 8 is a partially exploded perspective view of another embodiment of a rung and standoff mechanism.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. 1-3, a fire escape ladder assembly 90 according to the invention comprises a ladder enclosure 100 adapted to be installed within a wall 40 underneath a windowsill 50. Ladder enclosure 100 desirably comprises a metal box or receptacle having sides 116 and a top 117 and a bottom 119, a closed back 121, and an open front 123. A mounting flange 118 can extend outwardly from the front edge of the box. If the box is to be completely concealed in a wall, the box may not employ a mounting flange. The box is formed by stamping or bending or other suitable manufacturing method and may be formed out of any material suitable for the purposes. Steel is desirable. A substantially flat enclosure cover 110 covers the open front of enclosure 100 and a ladder 150 within the enclosure 100 when the fire escape ladder 150 is not in use. In the embodiment shown in FIG. 1, the ladder enclosure 100 extends from the windowsill 50 to a floor 60 of the structure.

Referring to FIG. 2, the ladder 150 is stowed within the enclosure interior compartment 112. The ladder 150 comprises a number of parallel rungs 154 connected at each end by bolts 155 that engage spaced links 157 in a chain support member 158 so that each rung is evenly spaced from other rungs 154 along the length of the ladder 150. The chains 158 shown in FIG. 2 that form the longitudinal portion of the ladder could be replaced with other known fire-resistant flexible support members. Each of the rungs 154 includes a pair of stand offs 162 (see FIG. 6) for positioning the ladder 150 away from an exterior wall of the building structure when the ladder 150 is in the deployed position.

Referring to FIG. 3, the enclosure 100 forms a substantially rectangular frame that is adapted to be mounted between a pair of building structure wall studs 42, 44, substantially filling the space between the studs 42, 44. Each of the enclosure sidewalls 116 is adapted to abut one stud

42, 44. If the enclosure further includes a face frame or flange 118, the frame can abut the surface of the wall 40 and provides a finished appearance around the edges of the enclosure 100. The face frame is screwed into the building studs by screws 105 to mount the frame in place. The frame can be mounted in an existing wall, with the flange on the outer side of the wall; or the frame can be installed in new construction, with the flanges being mounted under or over the wall board, as desired. The flange can be eliminated if desired for a flush construction.

As particularly shown in FIG. 3, a rod 120 threaded at least on the ends is mounted in the enclosure 100 for the purpose of anchoring the ladder 150 while in the deployed position. The ladder is not shown in FIG. 3 for purposes of clarity. The threaded rod 120 is adapted to pass through openings 49 in the enclosure sidewalls 116 and through openings in the adjacent studs 42, 44. With the enclosure 100 in place between studs 42, 44, opposing apertures 46, 48 are drilled through the adjacent studs 42, 44. The apertures 46, 48 are aligned with apertures 49 on opposite enclosure sidewalls 116.

Threaded rod 120 includes a first end 124 and a second end 128. Threaded rod 120 is of a length such that first end 124 can be passed through aperture 46 a sufficient distance so that second end 128 can be aligned with aperture 48. Second end 128 is then passed through aperture 48 so that threaded rod 120 is centered on enclosure 100, each of ends 124, 128 extending into or through studs 42, 44. Prior to threaded rod 120 being fed through apertures 46, 48, a pair of lock nuts 122 are threaded onto threaded rod 120, and upper end links 159 of ladder chains 158 are slid onto threaded rod 120. With threaded rod 120 centered in enclosure 100, lock nuts 122 are rotated to move outwardly on threaded rod 120 until they are flush against links 159 against enclosure sidewalls 116. This prevents threaded rod 120 from sliding to one side or the other and keeps threaded rod 120 within apertures 46, 48. (see FIG. 4). This further secures links 159 and anchors

ladder 150 on threaded rod 120. Hooks 180 (which can be conventional peg board hooks) are mounted on the back 121 of the enclosure and engage the ladder rungs and support the ladder in a folded condition in the enclosure. Peg board type hooks are desirable because they fall off when the ladder is deployed, thus preventing the hooks from obstructing the deployment of the ladder.

5 Referring to FIGS. 5 and 6, ladder 150 is deployed by removing the ladder 150 from within enclosure 100 and passing it through window opening 52 with an end of ladder 150 secured to threaded rod 120 within enclosure 100. Ladder 150 falls under gravity to be substantially parallel with the exterior wall of the structure. Ladder 150 is held a distance from the exterior wall by standoffs 162, which are arranged to abut against the exterior wall. The standoffs 162 can be
10 mounted on each rung 154 or can be mounted on every other rung 154, or other spacing.

A further embodiment of a ladder enclosure 200 is shown in FIG. 7. In some building structures, a windowsill 50 is positioned at a height close to floor 60, affording insufficient space for a ladder enclosure 100 according to the first embodiment. In such an instance, there is a need for a ladder enclosure 200 which affords sufficient room for storage of the ladder 150 (not shown).

15 The enclosure 200 incorporates a wall portion 210 and a floor portion 220. The wall portion 210 is positioned between adjacent wall studs 42, 44 while the floor portion 220 is positioned between adjacent floor joists 62, 64. A threaded rod 120 is inserted through apertures in the sidewalls 116 of the wall portion 210 and locked in place with lock nuts 122 in a similar fashion as to the first embodiment. The ladder 150 (not shown) is attached to the threaded rod 120 in a
20 similar fashion to the other embodiment, with the ladder 150 being stowed in both the wall section 210 and the floor portion 220 of enclosure 200. An L-shaped or hinged enclosure cover 222 covers the enclosure 200 when the ladder 150 is not in use. The ladder 150 is deployed in the same manner as in the first embodiment. The total length of enclosure 200, including wall and floor sections, is

the same as the wall unit described above, which is about twenty-four inches in a typical installation. The doors in both embodiments can be releasibly attached by a Velcro type hook and loop fastener 222 or other suitable and easily releasable fastener.

Another embodiment 250 of a rung and standoff assembly is shown in FIG. 8. While
5 rungs 154 are formed of tubes with flattened ends that are bolted to the links, rung 254 of assembly 250 comprises an elongated bar or channel member formed of aluminum or the like. Standoffs 262 also are aluminum bars or channel members positioned at each end of the rung 254. Openings 264 in the ends of the standoffs mate with threaded openings 266 in the ends of rung 254, and threaded fasteners 268 extend through openings 264 and into openings 266 to securely attach the standoffs
10 262 to the ends of rung 254.

The end of rung 254 includes three outwardly extending ribs 270, 272, and 274, with recesses 276 and 278 being positioned between the ribs. Rib 270 extends outwardly further than ribs 272 and 274 and abuts the end 280 of standoff 262 when the standoff is mounted to the rung. When the standoff is mounted to the rung, recesses 276 and 278 form downwardly extending
15 spaced openings through the ends of the rung and standoff assembly. A link 282 of the chain fits in recesses 276 and 278 so that the chain can be firmly clamped to the step mechanism by inserting a link in the chain in the recesses in the end of the step and then screwing the standoff in place on the end of the step.

While steps and standoffs formed of an aluminum bar material are satisfactory, the use of
20 other shapes, such as U-shaped channels, and other types of formed components, such as extruded, tubular, or stamped components, would be satisfactory and would involve less material and less labour and would provide a less expensive product.

It will be understood by one having ordinary skill in the art and by those who practice the invention, that various modifications and improvements may be made without departing from the spirit of the disclosed concept. Various relational terms, including left, right, front, back, top, and bottom, for example, are used in the detailed description of the invention and in the claims only to convey relative positioning of various elements of the claimed invention. The scope of protection afforded is to be determined by the claims and by the breadth of interpretation allowed by law.